FCC Part 15C Test Report

FCC ID: 2AKHDR241A

Product Name:	Wireless Switch
Trademark:	N/A
Model Name :	R241A R61A, R62A, R121A, R122A, R124A, R126A, R128A, R1212A, R1216A, R241A, R242A, R22011KA, R22021KA, R2201HPA, R221HPA, R10024011KA , R1002401HPA ,R10024041KA
Prepared For : Address :	Shenzhen Bo'ergao Electronic Technology Co., Ltd. 4 Floor, Dapu Industrial Park tongmiwen, Tai Village, Dapu village, Long Dong Community, Longgang District, Shenzhen, China
Prepared By : Address :	Shenzhen BCTC Technology Co., Ltd. No.101,Yousong Road,Longhua New District, Shenzhen,China
Test Date:	Nov. 20 – Nov. 25, 2016
Date of Report :	Nov. 27, 2016
Report No.:	BCTC-LH161111952E

TEST RESULT CERTIFICATION

Applicant's name	:	Shenzhen Bo'ergao Electronic Technology Co., Ltd.
Address	:	4 Floor, Dapu Industrial Park tongmiwen, Tai Village, Dapu village, Long Dong Community, Longgang District, Shenzhen, China
Manufacture's Name	:	Shenzhen Bo'ergao Electronic Technology Co., Ltd.
Address	:	4 Floor, Dapu Industrial Park tongmiwen, Tai Village, Dapu village, Long Dong Community, Longgang District, Shenzhen, China
Product description		
Product name	:	Wireless Switch
Trademark	:	N/A
Model and/or type reference	:	R241A R61A, R62A, R121A, R122A, R124A, R126A, R128A, R1212A, R1216A, R241A, R242A, R22011KA, R22021KA, R2201HPA, R221HPA, R10024011KA , R1002401HPA ,R10024041KA
Standards	:	FCC Part15B ANSI C63.4-2014

This device described above has been tested by BCTC, and the test results show that the equipment under test (EUT) is in compliance with the FCC requirements. And it is applicable only to the tested sample identified in the report.

This report shall not be reproduced except in full, without the written approval of BCTC, this document may be altered or revised by BCTC, personal only, and shall be noted in the revision of the document.

Testing Engineer	:	Eric Yang
Reviewer Supervisor	:	Jade Yang
Approved & Authorized Manager:	:	Carson Zhang

Table of Contents

Page

1. SUMMARY OF TEST RESULTS

Test procedures according to the technical standards:

FCC Part15			
Standard Section	Test Item	Judgment	Remark
Part 15.107	Conducted Emission	N/A	
Part 15.109	Radiated Spurious Emission	PASS	

NOTE:

(1)" N/A" denotes test is not applicable in this Test Report

1.1 TEST FACILITY

Shenzhen BCTC Technology Co., Ltd.
Add. : No.101,Yousong Road,Longhua New District, Shenzhen,China
FCC Registered No.: 187086

1.2 MEASUREMENT UNCERTAINTY

The reported uncertainty of measurement **y ± U**，where expended uncertainty **U** is based on a standard uncertainty multiplied by a coverage factor of **k=2**，providing a level of confidence of approximately **95** %。

No.	Item	Uncertainty
1	Conducted Emission Test	±1.38dB
2	RF power,conducted	±0.16dB
3	Spurious emissions,conducted	±0.21dB
4	All emissions,radiated(<1G)	±4.68dB
5	All emissions,radiated(>1G)	±4.89dB
6	Temperature	±0.5°C
7	Humidity	±2%

2. GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

Equipment	Wireless Switch
Trade Name	N/A
Model Name	R241A R61A, R62A, R121A, R122A, R124A, R126A, R128A, R1212A, R1216A, R241A, R242A, R22011KA, R22021KA, R2201HPA, R221HPA, R10024011KA , R1002401HPA ,R10024041KA
Model Difference	The product's different for model name and outlook color.
Product Description	The EUT is a Wireless Switch Based on the application, features, or specification exhibited in User's Manual, the EUT is considered as an ITE/Computing Device. More details of EUT technical specification, please refer to the User's Manual.
Power	DC 12-24V
hardware version	--
Software version	--
Serial number	--
Connecting I/O Port(s)	Please refer to the User's Manual
Max Operation Frequency	433MHz

Note:

1. For a more detailed features description, please refer to the manufacturer’s specifications or the User's Manual.

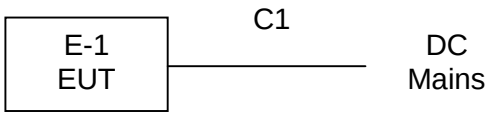
2.2 DESCRIPTION OF TEST MODES

To investigate the maximum EMI emission characteristics generates from EUT, the test system was pre-scanning tested base on the consideration of following EUT operation mode or test configuration mode which possible have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned above was evaluated respectively.

Pretest Mode	Description
Mode 1	RX Mode
For Conducted & Radiated Emission	
Final Test Mode	Description
Mode 1	RX Mode

2.3 BLOCK DIGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED

Radiated Emission Test



2.4 DESCRIPTION OF SUPPORT UNITS(CONDUCTED MODE)

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

Item	Equipment	Mfr/Brand	Model/Type No.	Series No.	Note
E-1	Wireless Switch	N/A	R241A	N/A	EUT

Item	Shielded Type	Ferrite Core	Length	Note
C1	No	No	0.8m	DC Line

Note: For detachable type I/O cable should be specified the length in cm in 『Length』 column.

2.5 EQUIPMENTS LIST FOR ALL TEST ITEMS

Radiation Test equipment

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until
1	Spectrum Analyzer	Agilent	E4407B	MY45109572	2016.08.27	2017.08.26
2	Test Receiver	R&S	ESPI	101396	2016.08.27	2017.08.26
3	Bilog Antenna	SCHWARZBECK	VULB9160	VULB9160-3369	2016.08.27	2017.08.26
4	50Ω Coaxial Switch	Anritsu	MP59B	6200264416	2016.08.27	2017.08.26
5	Spectrum Analyzer	Agilent	N9020A	MY5051041	2016.08.27	2017.08.26
6	Horn Antenna	SCHWARZBECK	9120D	9120D-1275	2016.08.29	2017.08.28
7	Horn Ant	Schwarzbeck	BBHA 9170	9170-181	2016.08.29	2017.08.28
8	Amplifier	SCHWARZBECK	BBV9718	9718-270	2016.08.29	2017.08.28
9	Amplifier	SCHWARZBECK	BBV9743	9743-119	2016.08.29	2017.08.28
10	Loop Antenna	ARA	PLR241A MI-BTH0730/B	1029	2016.07.06	2017.07.05
11	Power Meter	R&S	NRVS	100696	2016.08.27	2017.08.26
12	Power Sensor	R&S	URV5-Z4	0395.1619.05	2016.08.27	2017.08.26
13	RF cables	R&S	N/A	N/A	2016.08.27	2017.08.26
14	966 chamber	ChengYu	966 Room	966	2016.08.27	2017.08.26

Conduction Test equipment

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until
1	Test Receiver	R&S	ESCI	1166.5950K03-101165-ha	2016.08.27	2017.08.26
2	LISN	R&S	NSLK8126	8126466	2016.08.27	2017.08.26
3	LISN	R&S	NSLK8126	8126487	2016.08.27	2017.08.26
4	50Ω Coaxial Switch	Anritsu	MP59B	6200264417	2016.08.27	2017.08.26
5	RF cables	R&S	R204	R20X	2016.08.27	2017.08.26

3. EMC EMISSION TEST

3.1 CONDUCTED EMISSION MEASUREMENT

3.1.1 POWER LINE CONDUCTED EMISSION Limits (Frequency Range 150KHz-30MHz)

FREQUENCY (MHz)	Limit (dBuV)		Standard
	Quasi-peak	Average	
0.15 -0.5	66 - 56 *	56 - 46 *	FCC
0.50 -5.0	56.00	46.00	FCC
5.0 -30.0	60.00	50.00	FCC

Note:

(1) The tighter limit applies at the band edges.

(2) The limit of " * " marked band means the limitation decreases linearly with the logarithm of the frequency in the range.

The following table is the setting of the receiver

Receiver Parameters	Setting
Attenuation	10 dB
Start Frequency	0.15 MHz
Stop Frequency	30 MHz
IF Bandwidth	9 kHz

3.1.2 TEST PROCEDURE

a. The EUT was placed 0.8 meters from the horizontal ground plane with EUT being connected to the power mains through a line impedance stabilization network (LISN). All other support equipments powered from additional LISN(s). The LISN provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.

b. Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.

c. I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.

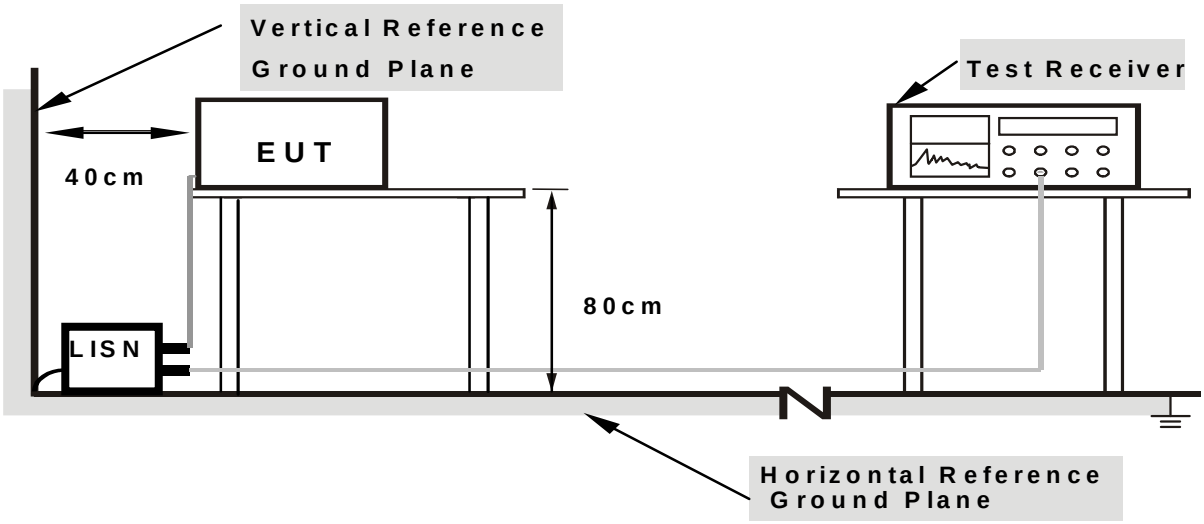
d. LISN at least 80 cm from nearest part of EUT chassis.

e. For the actual test configuration, please refer to the related Item –EUT Test Photos.

3.1.3 DEVIATION FROM TEST STANDARD

No deviation

3.1.4 TEST SETUP



Note: 1.Support units were connected to second LISN.
2.Both of LISNs (AMN) are 80 cm from EUT and at least 80 from other units and other metal planes

3.1.5 EUT OPERATING CONDITIONS

The EUT was configured for testing in a typical fashion (as a customer would normally use it). The EUT has been programmed to continuously transmit during test. This operating condition was tested and used to collect the included data.

3.1.6 TEST RESULTS

N/A:
The EUT's power provide by battery, no requriments for this item.

3.2 RADIATED EMISSION MEASUREMENT

3.2.1 RADIATED EMISSION LIMITS (Frequency Range 9kHz-1000MHz)

In case the emission fall within the restricted band specified on 15.205(a), then the 15.109(a) limit in the table below has to be followed.

Frequencies (MHz)	Field Strength (micorvolts/meter)	Measurement Distance (meters)
0.009~0.490	2400/F(KHz)	300
0.490~1.705	24000/F(KHz)	30
1.705~30.0	30	30
30~88	100	3
88~216	150	3
216~960	200	3
Above 960	500	3

Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~150kHz / RB 200Hz for QP
Start ~ Stop Frequency	150kHz~30MHz / RB 9kHz for QP
Start ~ Stop Frequency	30MHz~1000MHz / RB 120kHz for QP

3.2.2 TEST PROCEDURE

Below 1GHz test procedure as below:

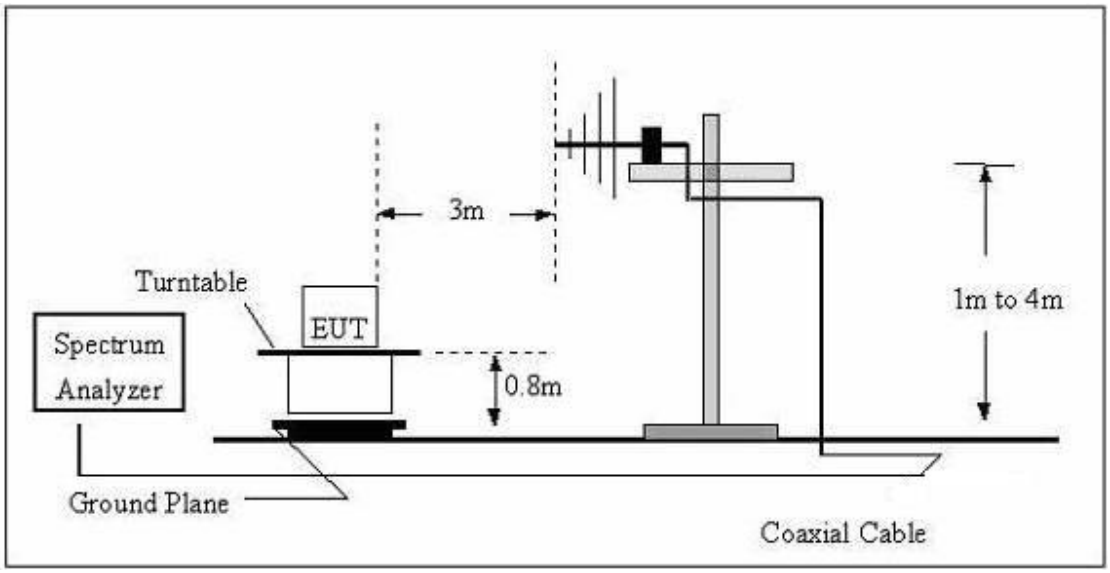
a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic camber. The table was rotated 360 degrees to determine the position of the highest radiation.
b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
c. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
f. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

3.2.3 DEVIATION FROM TEST STANDARD

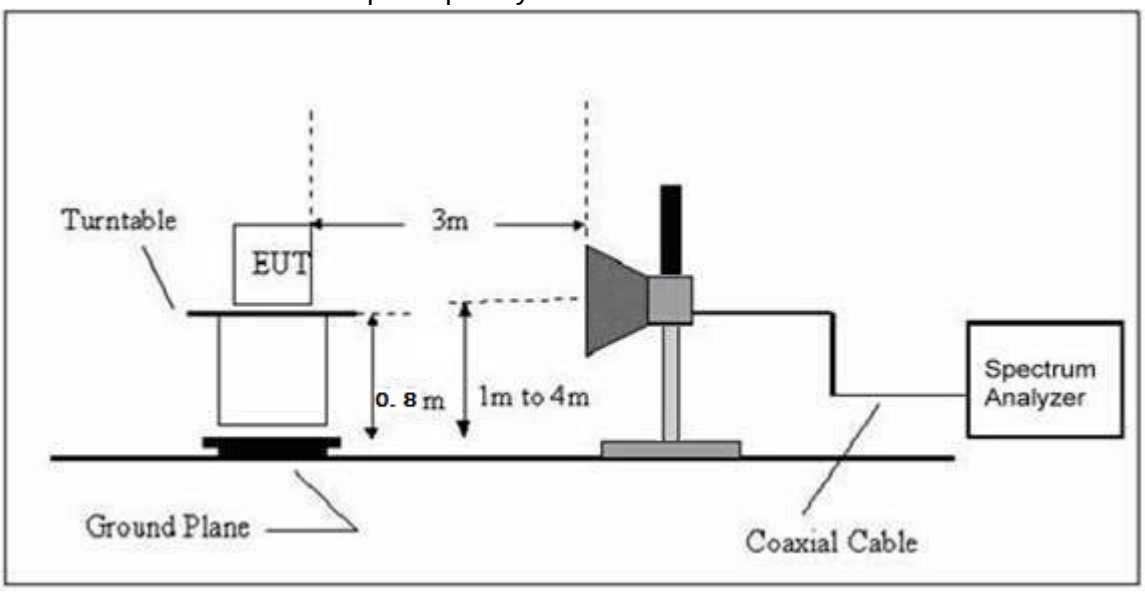
No deviation

3.2.4 TEST SETUP

（A）Radiated Emission Test-Up Frequency 30MHz~1GHz



（B）Radiated Emission Test-Up Frequency Above 1GHz



3.2.5 EUT OPERATING CONDITIONS

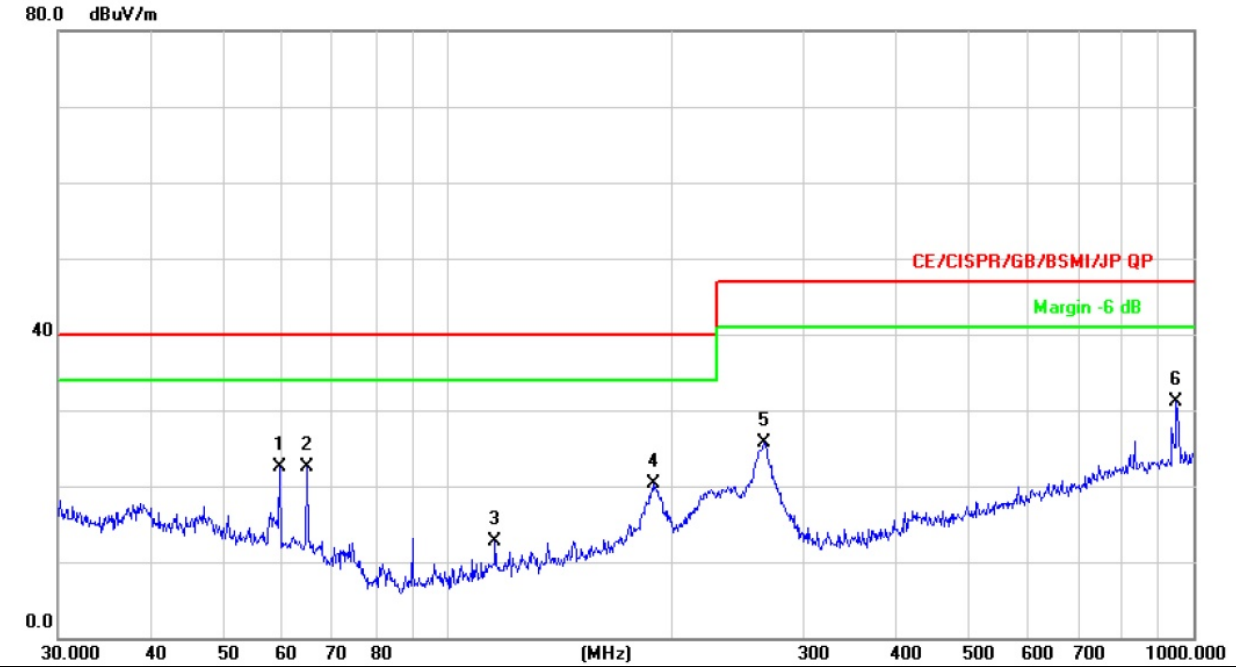
The EUT tested system was configured as the statements of 2.3 Unless otherwise a special operating condition is specified in the follows during the testing.

Note：

The emission above 1GHz is background, so no data about it.

3.2.6 TEST RESULTS (BETWEEN 30MHZ – 1GHZ)

Temperature :	26℃	Relative Humidity :	54%
Pressure :	1010 hPa	Polarization :	Horizontal
Test Voltage :	DC 24V		
Test Mode :	Mode 1		



Remark:
Factor = Antenna Factor + Cable Loss – Pre-amplifier.

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector
1		59.4405	33.88	-11.47	22.41	40.00	-17.59	QP
2		64.6594	34.86	-12.45	22.41	40.00	-17.59	QP
3		115.7256	27.80	-15.12	12.68	40.00	-27.32	QP
4		189.0743	35.70	-15.46	20.24	40.00	-19.76	QP
5		265.6757	39.35	-13.69	25.66	47.00	-21.34	QP
6	*	948.7610	31.49	-0.48	31.01	47.00	-15.99	QP

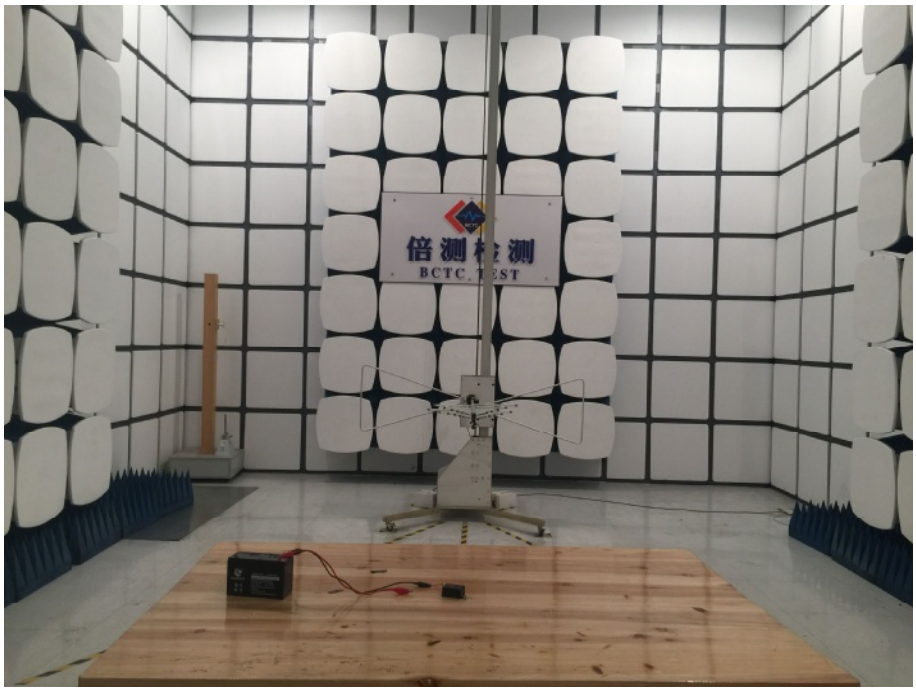
Temperature :	26℃	Relative Humidity :	54%
Pressure :	1010 hPa	Polarization :	Vertical
Test Voltage :	DC 24V		
Test Mode :	Mode 1		

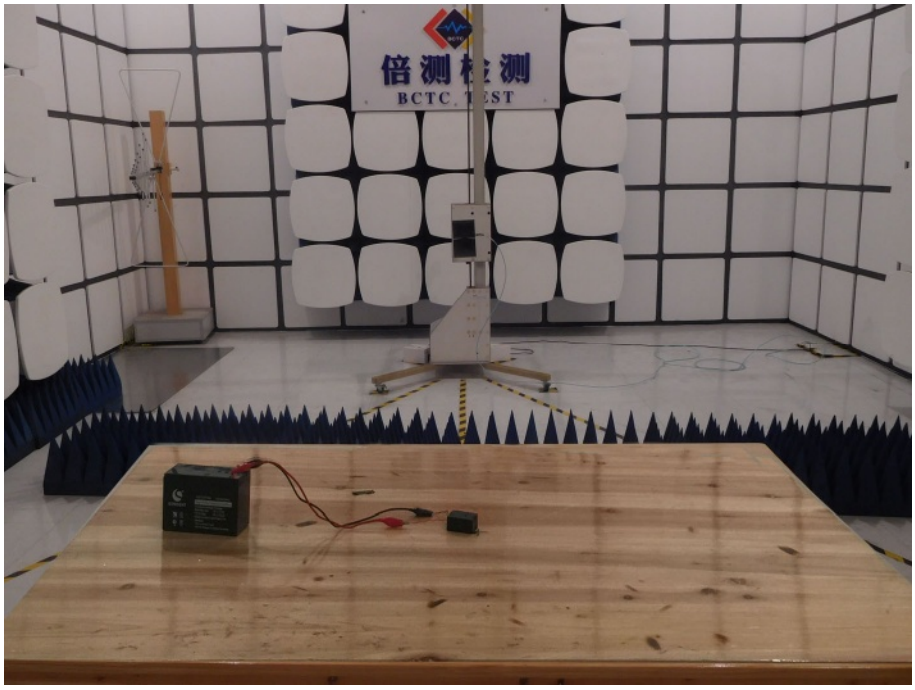
Remark:
Factor = Antenna Factor + Cable Loss – Pre-amplifier.

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector
1		53.8818	31.02	-10.93	20.09	40.00	-19.91	QP
2		89.5899	41.75	-17.55	24.20	40.00	-15.80	QP
3		188.4125	39.60	-15.37	24.23	40.00	-15.77	QP
4	*	226.0994	46.40	-15.29	31.11	40.00	-8.89	QP
5		264.7457	50.41	-13.72	36.69	47.00	-10.31	QP
6		952.0937	29.00	-0.46	28.54	47.00	-18.46	QP

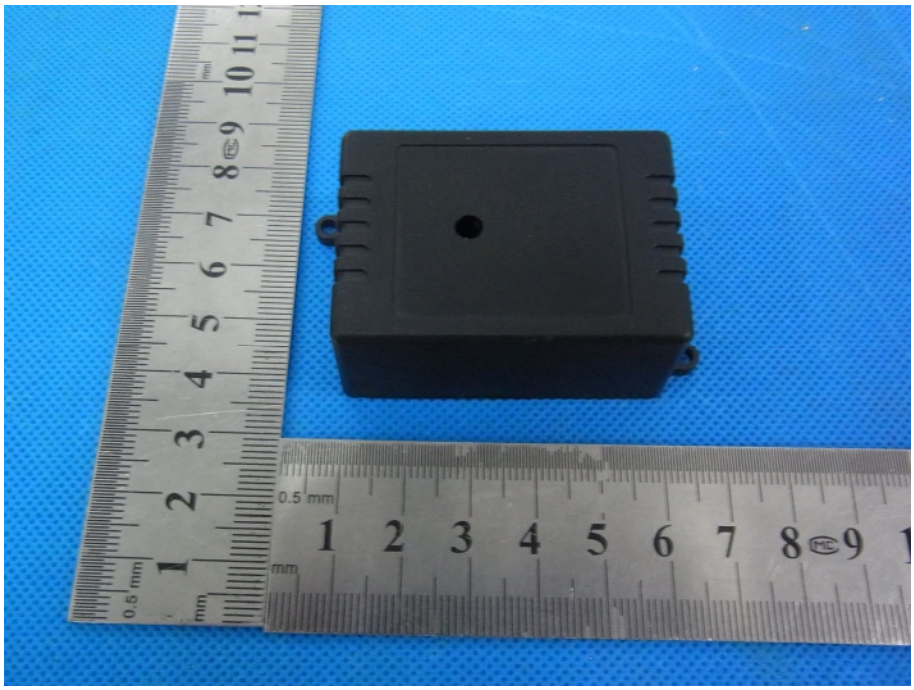
4. TEST SEUUP PHOTO

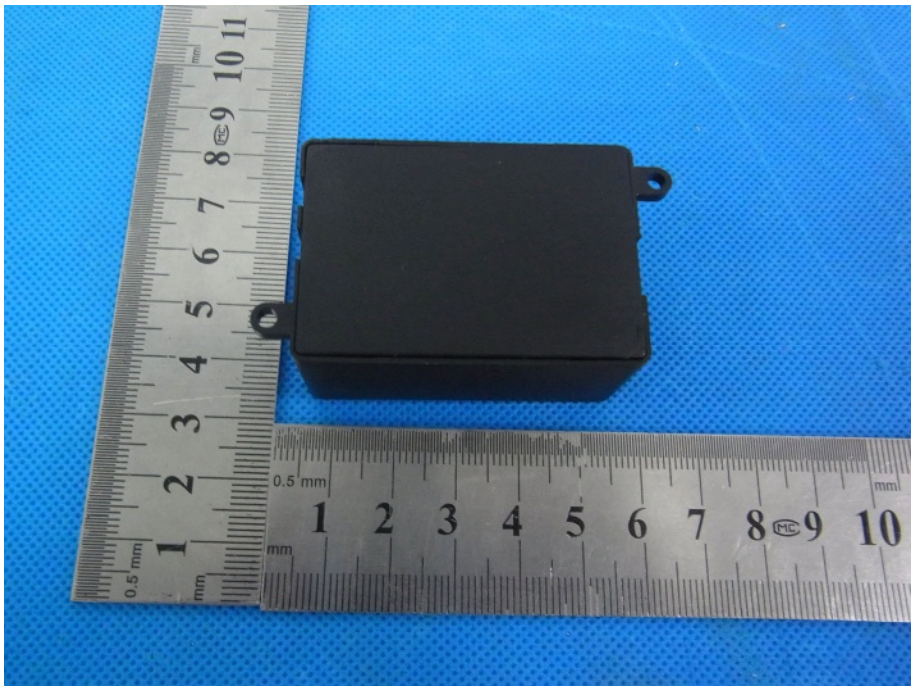
Radiated Measurement Photos

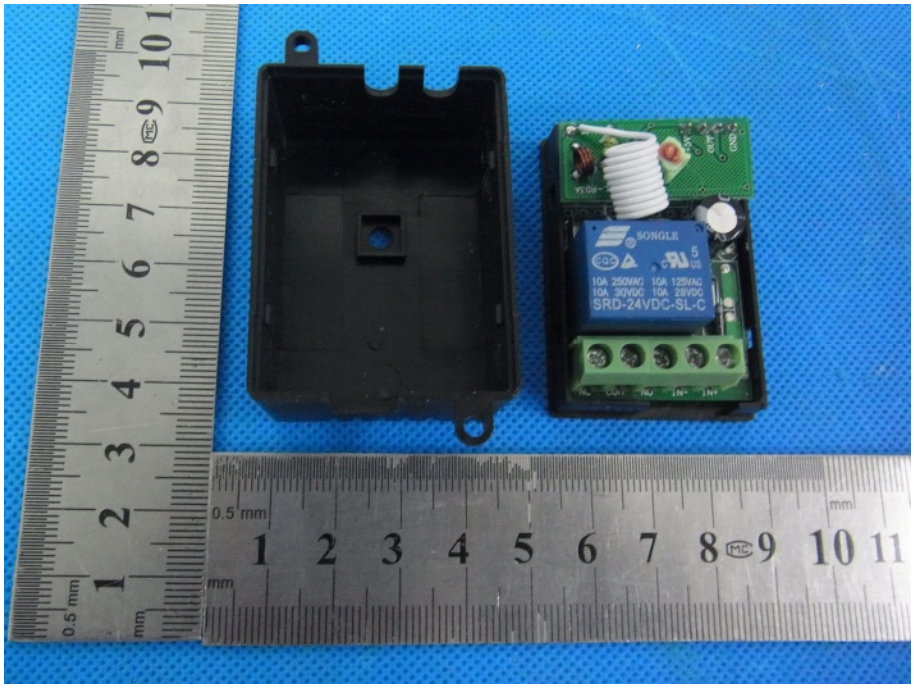




5. EUT PHOTO







※※※※※ **END OF REPORT** ※※※※※